Nest site variables and breeding progress of Phalacrocorax aristolelis

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Nest site variables and breeding progress of *Phalacrocorax aristolelis* on the Isle of Lunga

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Distribution

- World Population = 230,000-240,000
  - (Wetland International, 2015)
- British Isles Population = 34.1% of Global population
- Treshnish Population = 2.1% of British Isles Population
  - (Mitchell, et al., 2004)
- Rather sedentary:
  - Adults usually not moving more than 100km
- Three subspecies recognised with in its range:
  - P. a. aristotelis
  - P. a. desmarestii
  - P. a. riggenbachi

Niche

- Diving bird
- Opportunistic feeder, apart from

breeding season

- Feathers especially adapted, plumage is “Wettable”

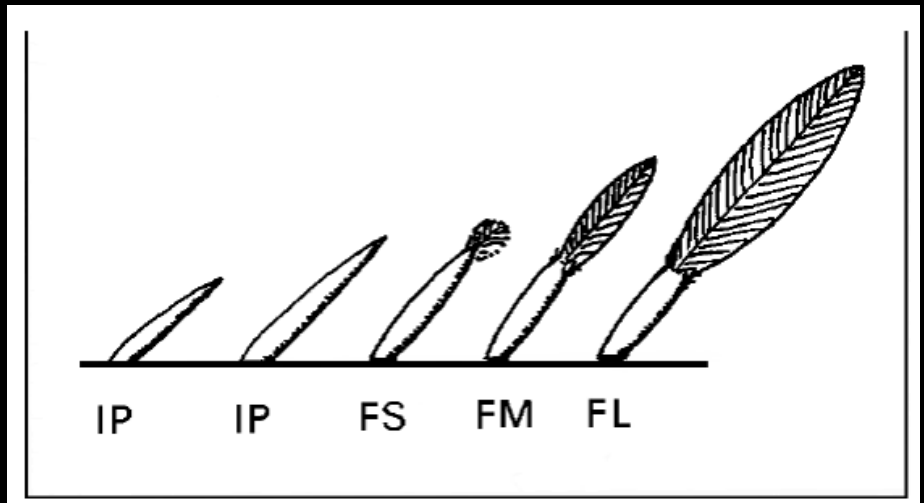
Aim

- To determine the impact of nest exposure on the breeding progress (measured by the stage of development of brood at time of surveying) of P. aristotelis.
- determine if there are any relationships between any of the variables measured, chiefly between the nest site variables (i.e. exposure, altitude above sea level and aspect of main entrance) and the biological brood variables (i.e. brood size, stage of development & average weight), but also between brood variables themselves.

- Nest site exposure
  - Lateral cover
  - Overhead cover
    - (adapted from Velando and Freire, 2003)

Methods

- Development Stage:
  - BTO Nest Record Scheme
- Weigh the chicks
  - Note brood size
- Altitude / GPS
- Data analysis:
  - Correlation coefficients
  - Kruskal-Wallis test



FS/FM/FL Primary feather growth stages.

Chicks and eggs

- Chicks per brood:
  - Most common: 3
  - Least: 1
- Eggs laid:
  - Most common: 3-4

Brood Variable Relations

- Stage of Development: Average Weight
  - Highly significant
- Brood Size / Average weight
  - No significant correlation
- Weight is very variable and not just about resources
  - A well-positioned brood may have twice the resources but three chicks
  - A poorly-positioned brood may only have one chick to feed, so a higher weight per chick
- Shags lay and incubate their eggs asynchronously
  - Age gap between chicks in same brood
  - Complicates weights and brood size

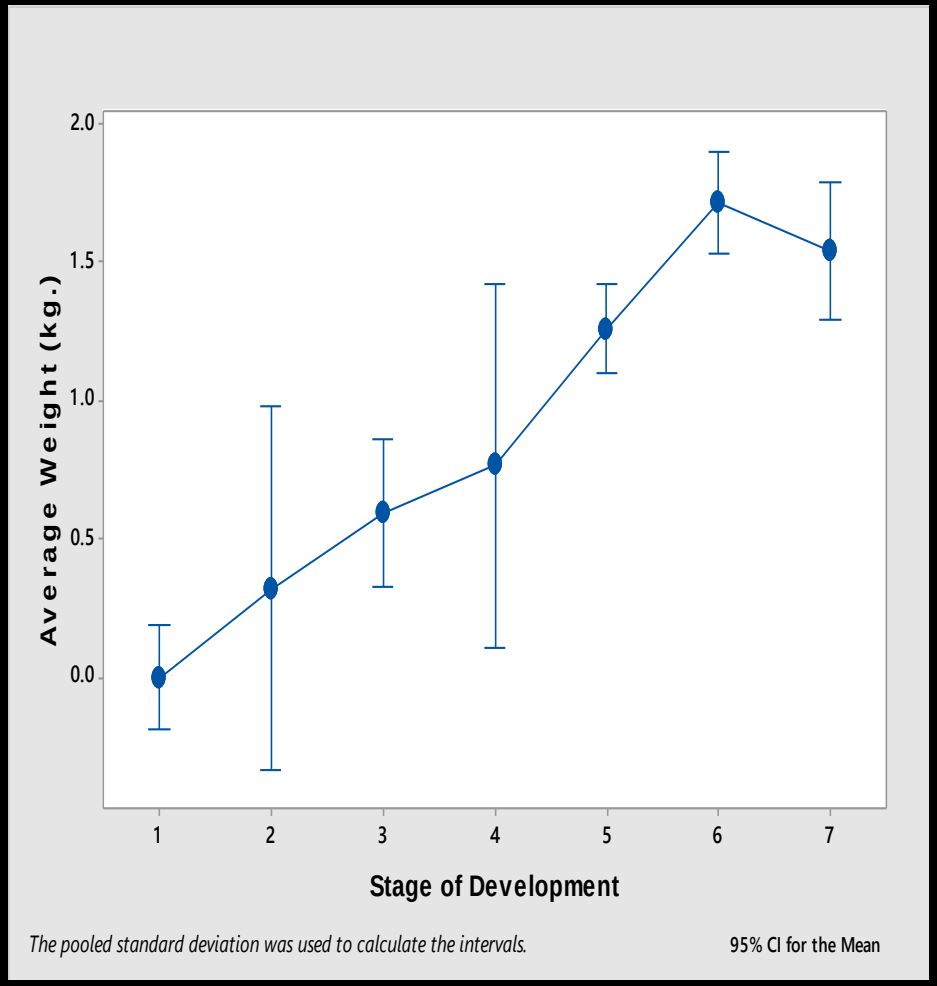
Results: Brood Variable Relations

Relationship	R-value	P-value
Stage of Development: Average Weight	0.880	0.000
Stage of Development: Brood Size	-0.193	0.193
Brood Size: Average Weight	0.082	0.546

highly significant (P<0.01) result: average weight correlates with stage of development

Results: Brood Variable Relations

- As chicks develop
  - Average weight rises until the Feathers Medium (6) stage.
  - Then average weight falls



Nest Exposure's Relationship with Breeding Progress

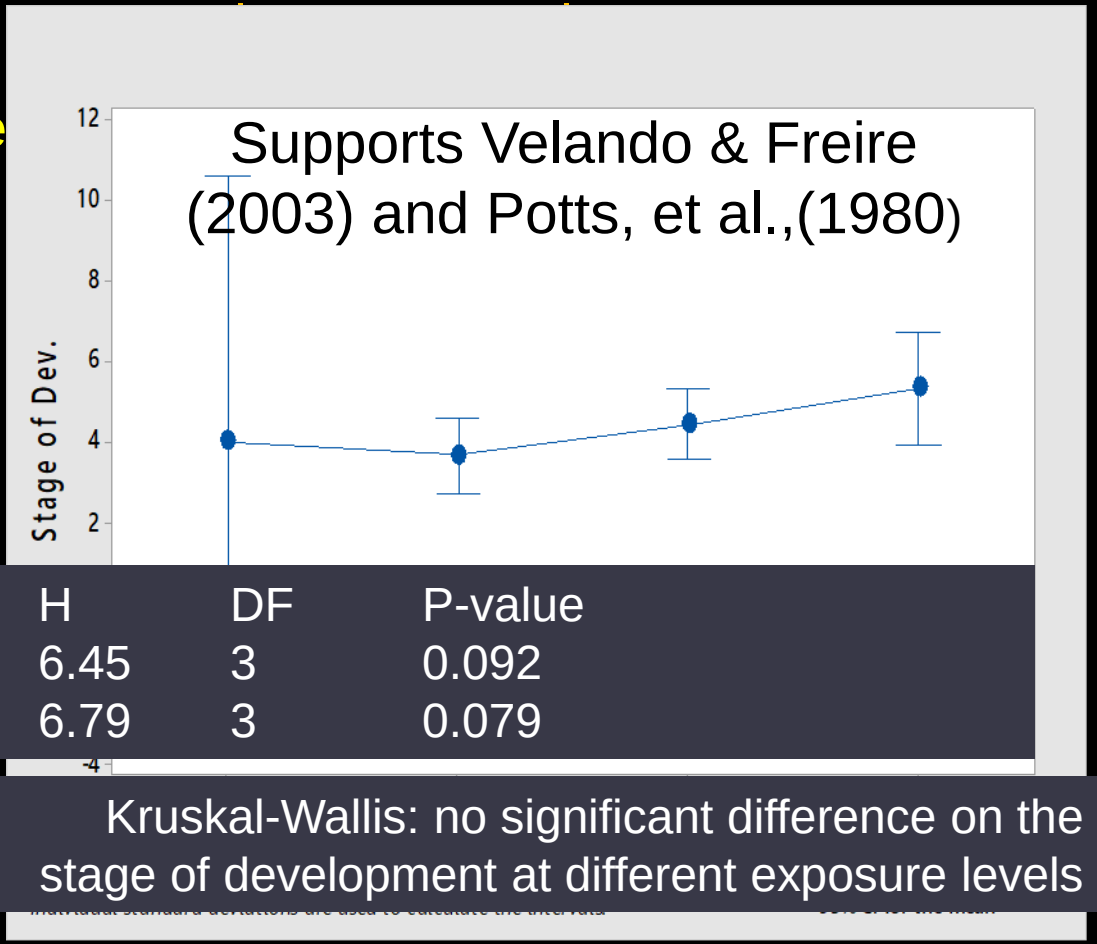
Relationship

Exposure: Stage of Developme

Exposure: Average Weight

Exposure: Brood Size

- Altitude
  - No significant correlation



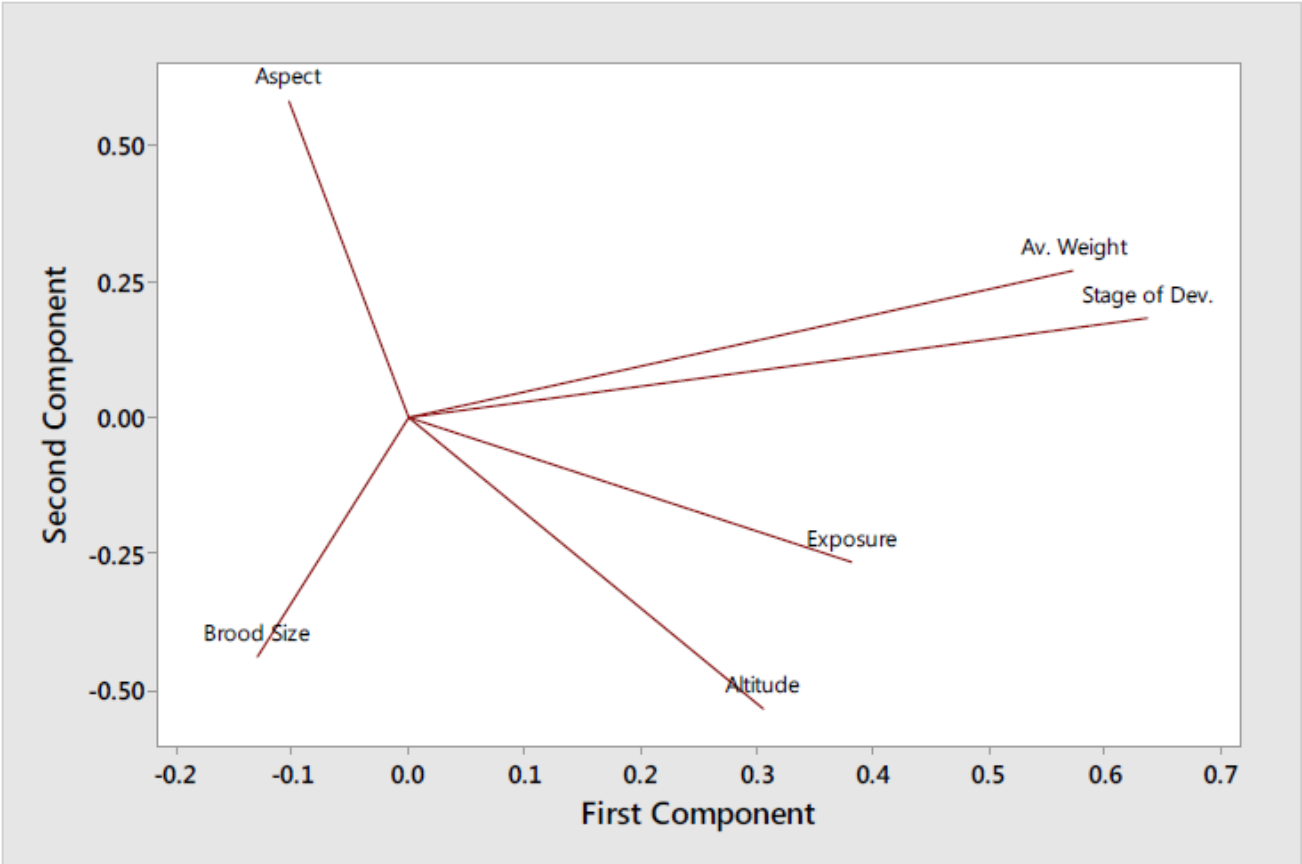
Relationship	H	DF	P-value
Exposure: Stage of Development	6.45	3	0.092
(adjusted for ties)	6.79	3	0.079

Kruskal-Wallis: no significant difference on the stage of development at different exposure levels

Principal Component Analysis

- Average weight and stage of development are closely related (Group 1)
  - Directly linked to age
- No strong relationship with any other variable

Principal Component Analysis



Conclusions

- Highly significant correlation between the stage of development and the average weight of the brood, with a strong positive linear relationship
- No significant relationship between brood size and average weight
- No linear relationship with nest exposure and fledging success
  - Best sites equate to more success in hatching
  - More exposure likely to increase predation